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10/809,804	03/26/2004	Hiroshi Kanno	50024-030	7163

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EXAMINER
YAMNITZKY, MARIE ROSE

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1794	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/809,804	KANNO ET AL.	
	Examiner	Art Unit	
	Marie R. Yamnitzky	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 November 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,7,9,10,12-14,16,18-20 and 22-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *13,14 and 23* is/are allowed.

6)☒ Claim(s) *1,4,7,9,10,12,16,18-20,22 and 25-27* is/are rejected.

7)☒ Claim(s) *24* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 21, 2008 has been entered.

2. Applicant's amendment filed November 21, 2008 amends claims 1, 13, 18 and 23, and cancels claims 11 and 21.

Claims 1, 4, 7, 9, 10, 12-14, 16, 18-20 and 22-27 are pending.

3. The rejection under 35 U.S.C. 112, 1st paragraph, as set forth in the Office action mailed August 21, 2008 is partly rendered moot by claim cancellation (for claims 11 and 21) and partly overcome by amendment (for claims 1, 4, 7, 9, 10, 12, 16, 18-20, 22 and 25-27). The examiner notes that with respect to claims 13, 14, 23 and 24, although the amendment alters the wording of these claims, the amendment does not alter the scope of these claims. Claims 13, 14, 23 and 24 previously required the first host material (the host material of the long wavelength light emitting layer) to be an anthracene derivative or an iridium complex, and required the assisting dopant of the short wavelength light emitting layer to be the same as the first host material. Claims 13, 14, 23 and 24 now require the assisting dopant of the short wavelength light emitting layer to be the same as the first host material, and to be an anthracene derivative or an iridium complex. Accordingly, the limitations with respect to the first host material (the host material of the long

wavelength light emitting layer) and the assisting dopant of the short wavelength light emitting layer for the device of claims 13, 14, 23 and 24 are the same as prior to entry of the amendment filed November 21, 2008. The examiner has reconsidered the rejection as applied to these four claims and withdraws the rejection.

The rejection of claims 1, 4, 7, 9-14, 16 and 18-27 under 35 U.S.C. 103(a) based on Igarashi et al. (US 7,291,405 B2) as set forth in the August 21st action is partly rendered moot by claim cancellation (for claims 11 and 21). With respect to claims 1, 4, 7, 9, 10, 12, 16, 18-20, 22 and 25-27, the rejection is overcome by amendment and in consideration of the certified translation of applicant's foreign priority application JP 2003-089415 (JP filing date of March 27, 2003); the certified translation was filed November 21, 2008. With respect to claims 13, 14, 23 and 24, the examiner notes that JP 2003-089415 does not fully support the limitations of these claims as this foreign priority application does not disclose a device in which the assisting dopant of the short wavelength light emitting layer is an anthracene derivative or an iridium complex and is the same as the host material of the long wavelength light emitting layer. However, the examiner has reconsidered the teachings of the '405 patent to Igarashi et al. and withdraws the rejection as applied to claims 13, 14, 23 and 24.

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 16, 18, 19, 22 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Mishima (US 2001/0053462 A1).

See the entire publication. In particular, see Example 4, Table 1 and the claims.

The device of Example 4 contains three separate light emitting layers.

One of the light emitting layers of the Example 4 device is a green light-emitting layer comprising 4,4'-N,N'-dicarbazolebiphenyl as a host material and tris(2-phenylpyridine) iridium as a green light-emitting material. Tris(2-phenylpyridine) iridium is an iridium complex that is a phosphorescent material having a molecular structure expressed by present formula (B1) as defined in present claim 16, and further expressed by the formula set forth in present claim 27, that provides a peak emission wavelength of 515 nm. The peak emission wavelength of the green light-emitting layer of the Example 4 device is within the scope of the peak wavelength range set forth in the present claims for the short wavelength light emitting layer.

One of the light emitting layers of the Example 4 device is a red light-emitting layer comprising 4,4'-N,N'-dicarbazolebiphenyl as a host material and bis(2-phenylquinoline)-acetylacetonate iridium as a red light-emitting material. Bis(2-phenylquinoline)acetylacetonate iridium is an iridium complex that is a phosphorescent material that provides a peak emission wavelength of 600 nm. The peak emission wavelength for the red light-emitting layer of the Example 4 device is within the scope of the peak wavelength range set forth in the present claims for the long wavelength light emitting layer.

The short wavelength (green) light-emitting layer and the long wavelength (red) light-emitting layer are formed in this order between anode and cathode in the device of Example 4.

The iridium complex in the green light-emitting layer of the device of Example 4 meets the limitations of the second phosphorescent material as well as of the assisting dopant required for the device of present claims 16, 18, 19, 22 and 27. With respect to the volume ratio limitation of claim 19, the device of Example 4 is prepared in the same manner as Example 3 except for using an iridium complex as the red light-emitting material. Based on the deposition rates of host material and green light-emitting material set forth in Example 3, the volume ratio of iridium complex in the green light-emitting layer of the device of Example 4 is about 14%.

With respect to the ratio of maximum peak luminous intensity as recited in present claim 22, Mishima does not disclose the ratio for the three peak wavelengths emitted by the exemplary devices. It is the examiner's position that it is reasonable to expect that Mishima's Example 4 device meets the limitations of claim 22 since Mishima's devices emit white light.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1, 4, 7, 9, 12, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mishima (US 2001/0053462 A1) as applied to claims 16, 18, 19, 22 and 27 above, and for the further reasons set forth below.

The iridium complex in the red light-emitting layer of the device of Example 4 meets the limitations of the first phosphorescent material as well as of the first assisting dopant required for the long wavelength light emitting layer of the device of present claims 1, 4, 9, 12, 25 and 26. With respect to the volume ratio limitation of claim 9, the device of Example 4 is prepared in the same manner as Example 3 except for using an iridium complex as the red light-emitting material. Based on the deposition rates of host material and red light-emitting material set forth in Example 3, the volume ratio of iridium complex in the red light-emitting layer of the device of Example 4 is about 3%.

Present independent claim 1 and claims dependent therefrom require the device to have the layered structure of anode, long wavelength light emitting layer, short wavelength light emitting layer, cathode. As noted above, Mishima's Example 4 device has the layered structure of anode, short wavelength light emitting layer, long wavelength light emitting layer, cathode.

With the exception of the order of the short wavelength light emitting layer and the long wavelength light emitting layer between the anode and cathode, the device of Mishima's Example 4 meets the limitations of present claims 1, 4, 9, 12, 25 and 26 wherein an iridium complex is used as the first phosphorescent material and the first assisting dopant. Regarding the order of the light emitting layers, it would have been an obvious modification to one of ordinary skill in the art at the time of the invention to reverse the order of the light emitting layers without changing the function of the device.

Present claim 7 depends from claim 4 and further limits the phosphorescent material to one having a tris(2-phenylquinoline)iridium skeleton. Mishima does not explicitly disclose an

iridium complex of the structure required by claim 7, but teaches that 2-phenylquinoline derivatives may be used. For example, see paragraph [0015]. The 2-phenylquinoline derivative used in Mishima's Example 4 device is an iridium complex having two 2-phenylquinoline ligands and an acetylacetonate ligand, whereas claim 7 requires an iridium complex having three 2-phenylquinoline ligands. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to utilize iridium complexes of 2-phenylquinoline other than the complex used in Mishima's Example 4. One of ordinary skill in the art at the time of the invention would have reasonably expected that a tris(2-phenylquinoline) iridium complex could be used for the same purpose as the bis complex utilized in Example 4 since Mishima's teachings in paragraph [0015] imply that any iridium complex of substituted or unsubstituted 2-phenylquinoline may be used.

With respect to the ratio of maximum peak luminous intensity as recited in present claim 12, Mishima does not disclose the ratio for the three peak wavelengths emitted by the exemplary devices. It is the examiner's position that it is reasonable to expect that Mishima's Example 4 device meets the limitations recited in claim 12 since Mishima's devices emit white light, and that reversing the order of the light emitting layers between the anode and cathode would not significantly affect the ratio of the peak emission wavelengths.

8. Claims 1, 4, 7, 9, 10, 12, 16, 18, 19, 20, 22 and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mishima (US 2001/0053462 A1) as applied above, and further in view of Sato et al. (US 2003/0218418 A9).

Present independent claim 1 and various claims dependent therefrom do not explicitly require the iridium complex used as the first assisting dopant, which is in the long wavelength light emitting layer, to be different from the iridium complex that may be used as the first phosphorescent material, which is in the long wavelength light emitting layer. However, claim 10, which depends from claim 1, sets forth an energy level relationship that necessarily requires at least three different materials in the long wavelength light emitting layer. Claim 1 and dependents encompass devices in which the long wavelength light emitting layer comprises three or more different materials.

Likewise, present independent claim 18 and various claims dependent therefrom do not explicitly require the iridium complex used as the assisting dopant in the short wavelength light emitting layer to be different from the iridium complex that may be used as the second phosphorescent material, which is in the short wavelength light emitting layer. However, claim 20, which depends from claim 18, sets forth an energy level relationship that necessarily requires at least three different materials in the short wavelength light emitting layer. Claim 18 and dependents encompass devices in which the long wavelength light emitting layer comprises three or more different materials.

Mishima's device of Example 4 does not have three different materials in the green light-emitting layer and/or in the red light-emitting layer, but Mishima's devices may have light-emitting layer compositions comprising more than two materials. Sato et al. teach light-emitting devices having a light-emitting layer disposed between an anode and a cathode. The light-emitting layer comprises a host material, Compound A and Compound B wherein Compound A

transfers energy to Compound B. Compound A is a phosphorescent material and may be an iridium complex. Compound B may also be a phosphorescent material and may be an iridium complex. Compound A functions as a sensitizer, intensifying the emission attributed to Compound B and increasing the efficiency of the device. For example, see the abstract, paragraphs [0047]-[0051], [0130]-[0151], [0156]-[0160], [0223] and [0233]. It would have been an obvious modification to one of ordinary skill in the art at the time of the present invention, having knowledge of the disclosure of Sato et al., to provide one or more of the light-emitting layers of Mishima's device with a combination of materials as taught by Sato et al. (i.e. combination of a host material, an iridium complex that functions as sensitizing Compound A, and an iridium complex that functions as emissive Compound B) in order to obtain the advantages taught by Sato et al. (e.g. increased device efficiency).

Further with respect to present claims 10 and 20, it would have been within the level of ordinary skill of a worker in the art at the time of the invention to select a combination of three materials for host, sensitizer and emissive compound having an appropriate relationship between HOMO energy levels so as to provide for transfer of holes from the host to the sensitizer to the emissive compound.

9. Miscellaneous:

In the amendment filed November 21, 2008, an extraneous dashed line is shown in formula (A1) in claim 4. Compare to formula (A1) as set forth in claim 4 of the amendment filed May 28, 2008. Correction is required.

10. Claims 13, 14 and 23 are allowed.

Claim 24 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 7:00 a.m. to 3:30 p.m. Monday-Friday.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

/Marie R. Yamnitzky/
Primary Examiner, Art Unit 1794

MRY
February 01, 2009